CLAIMS

1. A flexible superconducting core for superconducting power cable, wherein said core is a helical central tubular element in which the spiral or helix shaped superconducting tapes are applied in at least two layers with a calculated angle and lay length, said corrugated central core is made of stainless steel and consists of a mesh based on a first layer of steel tape of one size and a second layer of a different size; it also includes a second layer of copper tapes on which the superconducting tapes are applied, characterized because one of the sections of the layers of the superconducting tapes, next to the central core are laid in one direction opposite the other section of said superconducting layers external to the cable, wherein the laying length of all the layers varies from a maximum P_{max1} (1000 cm) and P_{max2} (1000 cm) in the intermediate layers and a P_{min1} (2 cm) and P_{min2} (2 cm) in the external layers, while the laying angle of the tapes in all the layers varies from α_{max1} (45°) to α_{min1} (0°) and from α_{max2} (45°) to α_{min2} (0°) in at least one of the layers of tapes placed between the external surface of the core and the inferior part of the layer, being the current distribution between the layers

uniform and each cable layer operating at total current conductance.

2. The flexible conductor core for superconducting power cable according to claim 1, characterized because the tube element has an external diameter preferably from 4 to 6 cm and an internal diameter between 2 and 4 cm in which the corrugation depth may vary between 0.5 cm and 1 cm and the corrugation pitch may vary from 1.6 to 3 cm.

3. The flexible conductor core for superconducting power cable according to claim 1, characterized because in the first layer, the stainless steel tapes have a width ranging from 4 to 5 cm and a thickness ranging from 0.005 to 0.006 cm and spacing ranging from 0.15 to 0.2 cm and then the second layer of stainless steel tape is applied which has a width ranging from 2.5 to 4 cm and a thickness ranging from 0.001 to 0.002 cm with a spacing ranging from 0.1 to 0.15 cm.

4. The flexible conductor core for superconducting power cable according to claim 1, characterized because the tubular core consists of a first layer of copper tapes with a width ranging from 0.25 to 4.0 cm and a thickness ranging from 0.025 to 0.030 cm with a laying length ranging from 2 to 100 cm.

5. The flexible conductor core for superconducting power cable according to claim 1, characterized because it operates with direct current, alternate current and current pulses.
6. The flexible conductor core for superconducting power cable according to claim 1, characterized because the conductor layers are made of metals and/or alloys with low electric resistance based on aluminum, copper or silver.
7. The flexible conductor core for superconducting power cable according to claim 1, characterized because the layers are made of one or several superconducting tapes, and the direction of the laying length of the tapes from the internal layer to the external layer changes only once independently of the number of the layers of the cable.
8. The flexible conductor core for superconducting power cable according to claim 1, characterized because the ratio of the number of layers placed in opposite direction is between 1:1 and 1:2.
9. The flexible conductor core for superconducting power cable according to claim 1, characterized because the superconducting elements to be used can be flat, round, oval or in the shape of a sector.

10. A manufacturing process for the superconducting core which is conducted on a tape-winding machine, characterized because it consists of the following steps: placing a corrugated central core (formador) made of flexible stainless steel; coating the core with a stainless steel mesh; with two layers of steel tapes of different width, placing a layer of copper tapes having a laying length of 2 to 100 cm; applying a first layer of superconducting tape at an application angle between 0° and 45°, being the process characterized by the geometrical placing of the superconducting material in tapes having a width ranging from 0.38 to 0.42 cm (BISSCC 22233 composition) and a thickness ranging from 0.018 to 0.022, obtaining a current density of 7 kA/cm^2; being the first three layers placed in a right or left sense with a lay length between 2 to 300 cm and an angle between 0° to 45°, being the other three layers made of superconducting material placed in the opposite sense with regard to the previous layers, and so on, depending on the design and finally a layer of reunifying tape is applied, said tape being made of an insulating material and having a thickness ranging from 0.005 to 0.01 cm and a width ranging from 2 to 4 cm.
11. A tape-winding machine to manufacture a conductor core for superconducting power cable, consisting of a bench

structure placed longitudinally, characterized by the following mechanical arrangements: an initial unwinding element placed in the front end of the machine and on which the core is placed; then an elongated bed of rolls; then a header element projecting longitudinally on which the superconducting tapes are placed on reels located laterally with regard to said headers; it then consists directionally of a second header through which the superconducting tape passes through a plurality of guide elements at an angle of up to 45° with a curve radius of up to 6 cm permitting laying angles from 1° to 60° and with cabling lays from 2 to 300 cm; it then consists directionally of a second bed of rolls to support the core and at the rear end of the bench it includes a winding element receiving said core.